

Illinois Space Grant Consortium
University of Illinois at Urbana-Champaign
Philippe H. Geubelle
217-244-8048
www.ae.illinois.edu/ISGC
Grant Number: NNX10AK65H

PROGRAM DESCRIPTION

The National Space Grant College and Fellowship Program consists of 52 state-based, university-led Space Grant Consortia in each of the 50 states plus the District of Columbia and the Commonwealth of Puerto Rico. Annually, each consortium receives funds to develop and implement student fellowships and scholarships programs; interdisciplinary space-related research infrastructure, education, and public service programs; and cooperative initiatives with industry, research laboratories, and state, local, and other governments. Space Grant operates at the intersection of NASA's interest as implemented by alignment with the Mission Directorates and the state's interests. Although it is primarily a higher education program, Space Grant programs encompass the entire length of the education pipeline, including elementary/secondary and informal education. The Illinois Space Grant Consortium is a Designated Consortium funded at a level of \$845,000 for fiscal year 2010.

PROGRAM GOALS

2010 ISGC Goals and Objectives

- Diversity in Fellowship/Scholarship, Research Infrastructure and Higher Education program areas.
 - reach the underrepresented minority percentage (currently 26.6%)
 - reach the ISGC target of 40% for female awards
- Fellowships and scholarships
 - provide scholarships and fellowships to students at ISGC academic institutions.
 - increase the number of applicants for fellowships/scholarships to 140 in 2010
 - ninety percent of scholarship recipients will enter graduate school or STEM employment at their "next educational step" (66% employment specifically at NASA, aerospace companies, universities or other educational institutions)
- Undergraduate research programs/assistantships in aerospace engineering and science
 - increase the number of research opportunities for undergraduates by 50% in 2010
 - there will be six undergraduate research programs at ISGC academic institutions

- ninety percent of undergraduate research program participants will enter graduate school or STEM employment at their “next educational step” (66% employment specifically at NASA, aerospace companies, universities or other educational institutions).
- Seed grants
 - at least two out of the ten awardees will receive additional research funding
 - at least four of the grants will be awarded to women or underrepresented minorities
 - a community college will be involved with at least one of the seed grants
- External internships/Academies
 - at least three NASA Center summer interns from ISGC academic institutions will be supported during summer 2010
 - will establish internship opportunities at *each* of its industrial/national lab partners
 - number of internship programs at industrial/national laboratory partners will increase by 50%
 - three students from ISGC institutions will be funded to attend the hands-on Connecticut Space Grant Helicopter Experience
- Educational activities outside of classroom
 - support for at least five projects in a variety of areas: two in aeronautics, two space-related, and one in space robotics
 - students from Chicago-area community colleges will be recruited to apply for at least one of the projects
- Higher education STEM courses
 - support at least four course development activities that expand the STEM knowledge
 - support at least two new or revised course that incorporates hands-on activities
 - support the development of a Systems Engineering curriculum
 - two aerospace-related systems engineering courses will be developed and offered
- Teacher training
 - offer standards-based teacher training in geographically diverse areas of the consortium
- Informal education
 - offer two informal education programs in both Chicago and Rockford that will reach at least 100,000 individuals
 - at least one informal education program will focus on rural Illinois communities

- at least one informal education program will involve collaboration with a community college

PROGRAM/PROJECT BENEFIT TO OUTCOME (1,2, OR 3)

- Outcome 1: Dr. Kim Coble of Chicago State University (CSU) was selected to be a member of US delegation to 4th IUPAP Conference on Women in Physics (April 2011); her presentation will include her ISGC funded research
- Outcome 1: ISGC funds helped build Dr. Edmundo Garcia's research group, which has led to funding collaborative work at Hadron Collider.
- Outcome 1: 23% increase in number of students funded to participate in Higher Education and Research Infrastructure programs over 2009. 29% increase in the number of fellowships and scholarships awarded compared to 2009.
- Outcome 1: Three faculty from ISGC affiliates participated in a regional workshop conducted by the Missouri Space Grant. The workshop focused on incorporating hands-on model aircraft design and construction into the classroom.
- Outcome 1: ISGC co-directed the 2010 Great Midwestern Region meeting with Minnesota Space Grant; meeting in Minneapolis. Fifty students from the region's affiliates participated in a poster competition. The focus of the meeting was hands-on student projects.
- Outcome 2: 31.6% increase in number of teachers enrolled in DePaul University's MSSE degree program, compared to 2009.
- Outcome 2: Discovery Center almost doubled (68 in 2009, 115 in 2010) the number of educators that participated in its K-12 teacher training programs.
- Outcome 3: A new program, "Astronomy Conversations" at Adler Planetarium, was funded. This daily program allows Adler visitors to interact with working scientists. So far in FY 2010, 20,000 visitors have participated in this activity.

PROGRAM ACCOMPLISHMENTS

Outcome 1:

- *Diversity in Fellowship/Scholarship, Research Infrastructure and Higher Education program areas*
 - direct participation by underrepresented minorities was 30.4% (target was 26.6%)
 - direct participation by females was 33%; with fellowships/scholarships ISGC was able to exceed its goal of 40% (44.4%), but it has been difficult to find females to apply and fill the internship positions in both Research Infrastructure (internships at our affiliates) and Higher Education (industry and NASA internship) programs.

- *Fellowships and scholarships*
 - applications were received from all academic affiliates in ISGC
 - received 130 fellowship and scholarship applications, making the selection process very competitive
- *Undergraduate research programs/assistantships in aerospace engineering and science*
 - (2) new undergraduate research programs have been established at ISGC academic institutions, bringing total to (6) programs
- *Seed grants*
 - ten seed grants were awarded to junior faculty/researchers
 - (2) published papers; (2) papers submitted, not yet published; (6) proposals for funding, totaling \$5,766,120, submitted; at this time (3) of submitted proposals funded at \$196,120.
 - four of the ten grants were awarded to women or underrepresented minorities
 - Harold Washington Community College was involved with Dr. Coble's research at CSU.
- *External internships/Academies*
 - three students from ISGC academic institutions were supported to attend NASA Center Academies (Goddard and Marshall)
 - mechanism established to offer internship opportunities at *each* of its industrial/national lab partners
 - three students were selected for funding to attend the Connecticut Space Grant Helicopter Experience (but only two were able to attend)
- *Educational activities outside of classroom*
 - supported (4) projects: design/build fly remote control aircraft at UIUC; CubeSat at UIUC; high altitude balloon project at Adler with (2) undergrad interns; and robotic bat micro aerial vehicle at UIUC
 - students from Chicago-area community colleges were eligible to apply for NEAR Space intern program at Adler
- *Higher education STEM courses: (4) STEM course development activities were funded.*
 - At Northwestern, a new cosmic ray detection lecture demonstration was created for a non-science major Astronomy course. As a result, students were recruited to work in astronomy public outreach.
 - A new course, AE483 Aerospace Decision Algorithms, provides training in robotics and autonomous systems and provides hands-on experience working with uninhabited aerial vehicles, both of which have become critical to the modern NASA workforce. The course materials, both for in class presentation and for the laboratory component, have been completed and are being used successfully in a preliminary version of the course being co-taught by Prof. Timothy Bretl and

- Prof. Cedric Langbort in Spring 2011 to a restricted enrollment of 15 undergraduate students in the Department of Aerospace Engineering, UIUC.
- At SIUE, a new course was developed and will be added to our Astronomy Concentration Fall 2011. The course is a laboratory course (PHYS 118L). The PHYS 118L laboratory will have two components: a fifteen project computer based in class activity manual, and five observational astronomy projects using SIUE's newly constructed automated observatory.
 - At Chicago State, a new course Global Climate Change #1850 has been developed and is being offered for the first time Spring 2011. This course merges the principles of chemistry and urban ecology to examine global climate change, its impact on society and discuss the benefits of sustainable practices. The impact of human activity on the current climatic changes will be explored. Current literature will be reviewed supporting and opposing the climate change argument.
 - Included in the 2010 goals was a plan to support the development and implementation of a Systems Engineering curriculum at UIUC. Although the preliminary work of developing two associated aerospace engineering courses was completed, the curriculum could not be implemented due to budget problems/hiring freeze at UIUC; a Systems Engineering instructor could not be hired. The curriculum is now scheduled to start Fall 2011.

Outcome 2:

- *Teacher training*
 - Eight teacher training sessions were offered in 2010: (5) long-duration and (3) short duration. Three of the long-duration sessions were part of the Master of Science in Science Education (MSSE) degree program conducted by DePaul University.
 - Total of (262) teachers attended; (110) others (informal educators and education administrators) also participated

Outcome 3:

- *Informal education*
 - three informal education programs were funded that reached 29, 014 people
 - one program was conducted by Adler in Chicago and the other two were led by Discovery Center Museum of Rockford
 - YES program of the Discovery Center took place in the rural areas of Boone County, Stephenson County and Winnebago County in Illinois

NASA 2010 Education Priorities:

- *Hands-on student experiences:* In our university-based programs (Higher Education and Research Infrastructure), undergraduate and graduate students were involved in hands-on experiences through research with faculty, NASA Academies and participation in extracurricular design projects.
- *Middle school teachers:* The MSSE degree program at DePaul University targets middle school teachers in the Chicago Public School System

- *Community colleges:* Chicago State University is working with Harold Washington College (one of the City Colleges of Chicago) in astronomy education research. Harold Washington is also a partner with CSU, Cal State Fullerton and Loyola Marymount in a proposal submitted to NSF-FUES. The Discovery Center works with Rock Valley College and other community organizations to carry out exhibits and hands-on activities for “Discovery Engineering”, a National Engineer’s Week event.
- *Aeronautics research:* Summer intern participated in a UIUC research team to work on research for a future low-boom supersonic business jet. New flow correlations were developed at the Illinois Institute of Technology for variable aspect ratio, fully-developed turbulent channel flow.
- *Environmental Science and Global Climate Change:* Sabrina Bailey, a lecturer at CSU, developed the course “Global Climate Change”; this course merges the principles of chemistry and urban ecology to examine global climate change, its impact on society and discuss the benefits of sustainable practices. The course is being taught for the first time Spring 2011.
- *Diversity:* ISGC consists of (1) lead institution (University of Illinois at Urbana-Champaign), (9) other academic institutions and (2) informal education institutions. Seven of the institutions are located in the Chicago area; the other five are scattered across the state; (1) in the northwest, (2) central, (1) west and (1) south. Five of the universities grant PhDs, the other five focus mainly on undergraduates, but do grant some master degrees. More than 43% of the faculty and staff leading ISGC programs are women; 5% are underrepresented minorities. As noted in the earlier Diversity section, 30.4% of direct higher education participants were underrepresented minorities and 33% were females.
- *Research activities for early career faculty:* Ten seed grants were awarded to junior faculty and researchers for research in an area of interest to NASA (part of selection criteria.) Four of the grants were awarded to females or underrepresented minorities. This support has contributed to (3) published papers, (15) presented papers, (6) submitted proposals totaling more than \$5.7M and (3) funded proposals worth \$196k.

PROGRAM CONTRIBUTIONS TO PART MEASURES

- *Longitudinal Tracking:* Total awards = 113; Fellowship/Scholarship = 45; Research Infrastructure (undergrad research programs and seed grants) = 64; Higher Education = 3; Informal Education = 1. The majority of the 2010 recipients are still enrolled in current degree programs. Of the (5) who have graduated, (2) are in grad school; (1) applying to medical school; (1) is in STEM employment and (1) is seeking employment.
- *Course Development:* ISGC contributed to the development of (3) new courses and the revision of (1) course. (see details above)

- Matching Funds: ISGC has committed \$659,168 in cost sharing; required amount is \$610,000. This is a 1.08:1 ratio of committed to required cost sharing.
- Minority-Serving Institutions: Chicago State University began its status as an affiliate member in 2010. In 2010, CSU faculty received funding for: three seed grants, course development and five scholarships.

IMPROVEMENTS MADE IN THE PAST YEAR

- Chicago State University, a Minority-Serving Institution is now a fully active member of ISGC.
- ISGC has reconnected with Western Illinois University and expect it to restart its participation in the consortium in 2011.
- ISGC has better balanced the distribution of funding to Pre-College and Higher Education programs; in 2010, HE is at 13% and Pre-College is at 6%. In 2009, HE was at 8% and Pre-College at 11%.
- ISGC HQ began sending out monthly email news update to all affiliate directors. The practice will begin again in April 2011, following surgery and recovery of the Associate Director.

PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

University of Illinois at Urbana-Champaign

PhD-granting research university

Lead institution for ISGC

Public, land-grant institution

ISGC activities: management; undergraduate research; scholarships and fellowships; seed grants; course development; design/build/fly student projects

Illinois Institute of Technology

PhD-granting research university

Private university

ISGC activities: undergraduate research; scholarships and fellowships; seed grants; course development

Northwestern University

PhD-granting research university

Private university

ISGC activities: undergraduate research; scholarships and fellowships; seed grants; course development

The University of Chicago

PhD granting research university

Private university

ISGC activities: undergraduate research; scholarships and fellowships; seed grants;

Southern Illinois University Edwardsville

Master's-granting university (professional degrees in medical fields)

Public institution

ISGC activities: seed grants; scholarships and fellowships; course development

University of Illinois at Chicago

PhD granting research university

Public institution

ISGC activities: undergraduate research; scholarships and fellowships; seed grants

DePaul University, Chicago

Master's granting university

Private institution

Eighth-largest private, not-for-profit university in the nation

ISGC activities: scholarships; K-12 teacher training; undergraduate research; seed grants

Bradley University, Peoria

Master's granting university (one PhD program)

Private Institution

ISGC activities: scholarships; seed grants; K-12 teacher training

Chicago State University, Chicago

Master's granting university

Public institution

Recognized as a Minority Serving Institution

ISGC activities: undergraduate research; scholarships and fellowships; seed grants; course development

Western Illinois University, Macomb (will be reactivated in 2011)

Master's granting university

Public institution

ISGC activities: K-12 teacher training; scholarships

Adler Planetarium & Astronomy Museum, Chicago

Planetarium, education and research institution

Not-for-profit

ISGC activities: seed grants; K-12 teacher training; higher education programs; informal education programs

Discovery Center Museum, Rockford

Educational and recreational institution

Not-for-profit

ISGC activities: K-12 teacher training; informal education programs